REMARKS

The Office Action dated March 25, 2011 has been received and carefully noted. The following remarks are submitted as a full and complete response thereto.

Claims 1-12 are currently pending in the application and are respectfully submitted for consideration in view of the following remarks.

The Office Action rejected claims 1, 4, and 6-7 under 35 U.S.C. § 103(a) as being unpatentable over Asano (U.S. Patent Publication No. 2004/0054531) in view of Ichikawa (U.S. Patent No. 7,478,041). Claims 2, 3, and 8-12 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Asano and Ichikawa, further in view of Ito (U.S. Patent No. 7,076,433). Applicants respectfully request that these rejections be withdrawn and the claims allowed for at least the reasons discussed below.

As a preliminary matter, Applicants respectfully submit that the Office Action was improperly made final. MPEP 706.07(a) provides that "second or any subsequent actions on the merits shall be final, except where the examiner introduces a new ground of rejection that is neither necessitated by applicant's amendment of the claims, nor based on information submitted in an information disclosure statement filed during the period set forth in 37 CFR 1.97(c) with the fee set forth in 37 CFR 1.17(p)." In the present Office Action, the Examiner has introduced a new ground of rejection by citing the new reference of Ichikawa. The introduction of this new ground of rejection was not necessitated by claim amendments or based on information submitted in an information disclosure statement. In fact, the previous Response did not include any claim

amendments. Rather, the new ground of rejection was necessitated by Applicants' showing that the previously cited prior art reference of Kim (U.S. Patent Pub. No. 2004/0175006) did not constitute prior art with respect to the present application and could not be properly used to reject the application under 35 U.S.C. § 103(a).

Thus, because the Office Action has introduced "a new ground of rejection that is neither necessitated by applicant's amendment of the claims, nor based on information submitted in an information disclosure statement," the finality of the Office Action is improper. As a result, Applicants respectfully request that the finality of the Office Action be withdrawn.

Further, Applicants respectfully traverse the rejections of the claims for the reasons discussed below.

Claim 1, upon which claims 3, 4, 6, and 7 are dependent, recites an automatic speech recognition system, which recognizes speeches in acoustic signals detected by a plurality of microphones as character information. The system includes a sound source localization module configured to localize a sound direction corresponding to a specified speaker based on the acoustic signals detected by the plurality of microphones. The system includes a feature extractor configured to extract features of speech signals included in one or more pieces of information detected by the plurality of microphones. The system includes an acoustic model memory configured to store direction-dependent acoustic models that are adjusted to a plurality of directions at intervals. The system includes an acoustic model composition module configured to compose an acoustic

model adjusted to the sound direction, which is localized by the sound source localization module, based on the direction-dependent acoustic models in the acoustic model memory. The acoustic model composition module also configured to store the acoustic model in the acoustic model memory. The system includes a speech recognition module configured to recognize the features extracted by the feature extractor as character information using the acoustic model composed by the acoustic model composition module. The acoustic model composition module is configured to compose an acoustic model for the sound direction.

As will be discussed below, Applicants respectfully submit that the cited references do not disclose, either expressly or implicitly, all of the features of the present claims.

Asano describes speech recognition apparatus and a speech recognition method for speech recognition. A distance calculator 47 determines the distance from a microphone 21 to a user uttering. Data indicating the determined distance is supplied to a speech recognition unit 41B. The speech recognition unit 41B has plural sets of acoustic models produced from speech data obtained by capturing speeches uttered at various distances. From those sets of acoustic models, the speech recognition unit 41B selects a set of acoustic models produced from speech data uttered at a distance closest to the distance determined by the distance calculator 47, and the speech recognition unit 41B performs speech recognition using the selected set of acoustic models.

Ichikawa describes a speech recognition method to recognize a voice recorded by use of a microphone array by controlling a computer. The speech recognition method includes a voice inputting step of recording a voice by using the microphone array and storing voice data in a memory, and a sound source localization step assuming a sound source direction of the recorded voice based on the voice data stored in the memory and storing a result of the assumption in a memory. The method also includes a noise suppression step of decomposing the recorded voice into a component of a sound of the assumed sound source location and a component of a non-directional background sound based on the result of the estimation stored in the memory, extracting and storing voice data of the component of the assumed sound source direction of the recorded voice based on a result of the processing and storing into a memory, and a speech recognition step recognizing the recorded voice based on the voice data of the component of the sound source direction stored in the memory.

Ito describes extracting frequency component candidate points even though frequency and/or amplitude for a target signal and noises contained in a mixed input signal change dynamically (*See* Ito at col. 2, lines 14-17). In particular, Ito describes separating a target signal from a mixed input signal even though the frequency component candidate points for the target signal and noises are located close to each other.

Applicants respectfully submit that Asano, Ichikawa, and Ito, whether viewed alone or in combination, fail to disclose or suggest all of the elements of the present

claims. For example, Asano, Ichikawa, and Ito, whether viewed individually or combined, do not disclose or suggest, at least, "an acoustic model composition module configured to compose an acoustic model adjusted to the sound direction, which is localized by the sound source localization module, based on the direction-dependent acoustic models in the acoustic model memory, the acoustic model composition module also configured to store the acoustic model in the acoustic model memory," as recited in claim 1 and similarly recited in claims 2 and 8.

The Office Action appears to take the position that paragraph 0114 of Asano discloses this aspect of the claims. However, the cited portion of Asano merely discloses that the voice recognition unit 41B includes N acoustic model databases 104_1, 104_2, . . . , 104_n, wherein acoustic models of speeches uttered by a sound source are produced while varying the distance between the microphone and the sound source, and a set of acoustic models obtained for a particular distance is described in one database, and another set of acoustic models for a different distance is described in another database, and so on (Asano, paragraph 0114). Asano fails to disclose or suggest an acoustic model composition module that composes an acoustic model adjusted to the sound direction, based on the direction-dependent acoustic models in the acoustic model memory, and storing the composed acoustic model in the acoustic model memory. The portion of Asano referred to in the Office Action appears to be limited to describing that the acoustic models are produced by varying the distance of the microphone and the sound source. Ichikawa and Ito do not cure this deficiency in Asano.

The Office Action cited the profile fitting unit 33 of Ichikawa as being relevant to the present claims (Office Action, page 5). With respect to the profile fitting unit 33, Ichikawa discloses that, by using a base form sound such as white noise, for various frequencies ω of a range used for speech recognition, a profile ($P_\omega(\theta_0\theta)$) of the microphone array 111 when a directional sound source direction is θ_0) is obtained beforehand in possible various sound source directions (Ichikawa, column 10, lines 61-67). However, Ichikawa fails to disclose or suggest that the profile fitting unit composes an acoustic model adjusted to the sound direction, based on the direction-dependent acoustic models in the acoustic model memory, and stores the composed acoustic model in the acoustic model memory. Ito also fails to cure the deficiencies in Asano and Ichikawa.

Ito, as outlined above, is merely directed to separating a target signal from a mixed input signal even though the frequency component candidate points for the target signal and noises are located close to each other. Ito, like Asano and Ichikawa, fails to disclose or suggest the claimed acoustic model composition module.

Therefore, Asano, Ichikawa, and Ito, whether viewed individually or combined, fail to disclose or suggest, at least, "an acoustic model composition module configured to compose an acoustic model adjusted to the sound direction, which is localized by the sound source localization module, based on the direction-dependent acoustic models in the acoustic model memory, the acoustic model composition module also configured to store the acoustic model in the acoustic model memory," as recited in claim 1 and similarly recited in claims 2 and 8.

In addition, Applicants submit that Asano, Ichikawa, and Ito, fail to disclose or suggest "a stream tracking module configured to store the sound direction localized by the sound source localization module so as to estimate a direction in which the specified speaker is moving, the stream tracking module estimating a current position of the speaker according to the estimated direction," as recited in claim 8. In particular, none of the cited prior art disclose or suggest estimating a direction in which the specified speaker is moving and estimating a current position of the speaker according to the estimated direction. Asano only discloses estimating the direction of a sound source from the power and phase difference among speech signals detected by microphones (Asano, paragraph 0129). Asano makes no mention of estimating the direction a speaker is moving, and, therefore, does not disclose or suggest estimating a current position of the speaker according to the estimated direction.

Claim 5 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Asano, Ichikawa, and Ito, further in view of Okuno (U.S. Patent No. 7,035,418). This rejection is respectfully traversed for at least the reasons discussed below.

Asano, Ichikawa, and Ito are outlined above. Okuno describes a method and apparatus for determining sound source. More specifically, Okuno describes a sound source identifying apparatus having a sound collecting means to capture sounds from a plurality of sound sources with a pair of sound collecting microphones (*See* Okuno at col. 2, lines 5-9).

Claim 5 is dependent upon claim 2, and inherits all of the limitations thereof. As discussed above, Asano, Ichikawa, and Ito do not disclose or suggest all of the elements of claim 2. In addition, Okuno does not cure the deficiencies in Asano, Ichikawa, and Ito, because Okuno also fails to disclose or suggest "an acoustic model composition module configured to compose an acoustic model adjusted to the sound direction, which is localized by the sound source localization module, based on the direction-dependent acoustic models in the acoustic model memory, the acoustic model composition module also configured to store the acoustic model in the acoustic model memory." Therefore, the combination of Asano, Ichikawa, Ito, and Okuno fails to disclose or suggest all of the elements of claim 5. Also, claim 5 should be allowed for at least its dependence upon claim 2, and for the specific limitations recited therein.

For at least the reasons discussed above, Applicants respectfully submit that none of the cited references, whether considered alone or in combination, disclose, either expressly, implicitly or inherently, all of the elements of the claimed invention. These distinctions are more than sufficient to render the claimed invention unanticipated and unobvious. It is therefore respectfully requested that all of claims 1-12 be allowed, and this application passed to issue.

If for any reason the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by telephone, the applicants' undersigned representative at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

In the event this paper is not being timely filed, the applicants respectfully petition for an appropriate extension of time. Any fees for such an extension together with any additional fees may be charged to Counsel's Deposit Account 50-2222.

Respectfully submitted,

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